

(12) **United States Patent**
Boesen

(10) **Patent No.:** **US 6,694,180 B1**
(45) **Date of Patent:** ***Feb. 17, 2004**

(54) **WIRELESS BIOPOTENTIAL SENSING
DEVICE AND METHOD WITH CAPABILITY
OF SHORT-RANGE RADIO FREQUENCY
TRANSMISSION AND RECEPTION**

(76) **Inventor:** **Peter V. Boesen**, 4026 Beaver Ave.,
Des Moines, IA (US) 50310

(*) **Notice:** Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.
This patent is subject to a terminal dis-
claimer.

(21) **Appl. No.:** **09/750,951**

(22) **Filed:** **Dec. 28, 2000**

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/640,230, filed on
Aug. 16, 2000, and a continuation-in-part of application No.
09/619,233, filed on Jul. 19, 2000, and a continuation-in-part
of application No. 09/607,305, filed on Jun. 30, 2000, and a
continuation-in-part of application No. 09/587,743, filed on
Jun. 5, 2000, now Pat. No. 6,408,081, and a continuation-
in-part of application No. 09/570,758, filed on May 15,
2000, now Pat. No. 6,470,893, and a continuation-in-part of
application No. 09/560,205, filed on Apr. 28, 2000, and a
continuation-in-part of application No. 09/416,168, filed on
Oct. 11, 1999.

(51) **Int. Cl.⁷** **A61B 5/05**

(52) **U.S. Cl.** **600/547**

(58) **Field of Search** 600/300, 484,
600/485; 128/903, 904; 119/174; 381/312;
604/97.03

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,150,262 A 4/1979 Ono
4,248,241 A 2/1981 Tacchi
4,334,315 A 6/1982 Ono et al.
4,374,382 A 2/1983 Markowitz
4,528,987 A 7/1985 Slocum

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

EP 0 683 621 A 11/1995
GB 2 074 817 11/1981
WO WO 98/34530 8/1998

OTHER PUBLICATIONS

Article entitled Agilent Technologies Announces Availabil-
ity of Wireless Network Cap for Portable Patient Monitor,
[http://www.healthcare.agilent.com/press_releases/
PRHS2920030.html](http://www.healthcare.agilent.com/press_releases/PRHS2920030.html).

Article entitled "Agilent Technologies Introduces New
Telemon Patient Monitor," [http://www.healthcare.agilent-
com/press_releases/PRHS2920016.html](http://www.healthcare.agilent.com/press_releases/PRHS2920016.html).

Article entitled "M3 and M4 Series Patient Monitors,"
[http://www.healthcare.agilent.com/show_product.pl?M3
%20and%20M4%20Series%20Patient%20Monitor.html](http://www.healthcare.agilent.com/show_product.pl?M3%20and%20M4%20Series%20Patient%20Monitor.html).

Article entitled "What is a Wireless LAN?", 1998, Proxim,
Inc.

Bluetooth Usage Model, [http://www.bluetooth.com/blue-
toothguide/models/ultimate.asp](http://www.bluetooth.com/bluetoothguide/models/ultimate.asp) (visited Jun. 26, 2000).

(List continued on next page.)

Primary Examiner—Eric F. Winakur

Assistant Examiner—Nikita R Veniaminov

(74) *Attorney, Agent, or Firm*—McKee, Vorhees & Sease,
P.L.C.

(57) **ABSTRACT**

Devices, systems and methods related to biopotential sens-
ing and medical monitoring are disclosed. Biopotential
sensor units include a transmitter for wirelessly transmitted
the biopotential information. The transmitter may be limited
by its transmission power and range in order to reduce
electromagnetic interference. The biopotential sensors
include an external auditory canal temperature sensor, an ear
pulse oximeter, and a hypnotic state sensing EEG. The
sensor units communicate with a patient monitor unit
located on a patient. The patient monitor unit wirelessly
communicates with a central station.

17 Claims, 8 Drawing Sheets

